LARAe: Learning Analytics Reflection & Awareness environment

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Abstract. Exploring and managing the abundance of data that Learning Analytics generate is a challenge for both teachers and students. This paper introduces a Learning Dashboard that provides an overview, context and content of learner traces to help students with awareness of feedback and progress, and assist teachers with monitoring student effort and outcomes to intervene where needed.

Keywords: learning analytics, learning dashboards, awareness, information visualization, effort, intervention, inquiry-based learning

1 Introduction

The purpose of Learning Analytics is understanding and optimizing learning and the environments in which it occurs [1]. Through dashboards, Learning Analytics can help support both teacher and students [2].

Learning Dashboards can rely on many different ways of visualizing raw analytics data e.g. bar, star and bubble charts, interactive histograms, parallel coordinates etc [2]. These visualization techniques can provide broad insights on student activities [3, 4]. By adding teacher traces, our visualization also attempts to provide awareness of feedback to improve its supportive role for both student and teacher.

This abundance of data can be abstracted to the essentials [5, 6], but context and content can help provide deeper insights [7]. Following the visual information-seeking mantra of "Overview first, zoom and filter, then details-on-demand" [8], our dashboard presents users with an abstract overview while still retaining a sense of context and providing access to the details.

2 LARAe: Design & Implementation

LARAe visualizes traces gathered from 38 engineering students, teachers and external participants in an open User Interfaces course. Students worked in groups of 3 and reported weekly through blog posts, comments and Twitter. The course generated 419 blog posts, 1580 comments and 538 tweets.

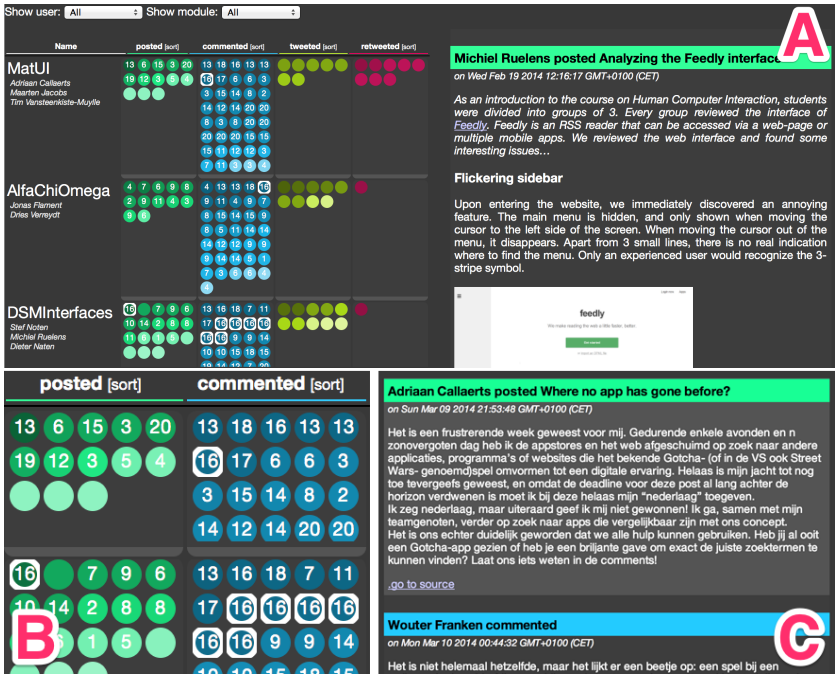

Fig. 1. LARAe: A. Overview, B. Activities, C. Thread view

Every activity is represented by a circle (Figure 1.B) which provides direct access to the related content (e.g. blog post, comment, tweet, retweet). Activities are sorted chronologically, from top left to bottom right. Gradient color values (see Figure 1.A) help recognize the age of an activity. A table (Figure 1.B) structures the activities by student group and type. Every column represents an activity type, every row a student group. The user can sort the data by any activity type. Both activity age and amount help facilitate awareness of (in)active groups. As teaching staff feedback was deemed important by both student and teacher, a second table visualizes activities of teacher activity in a similar way.

Context plays an important role in understanding the activities e.g. a comment without its surrounding discussion is difficult to assess. We propose a "focus+context" [9] solution which consists of 2 parts: highlighting related events (Figure 1.B) and displaying the content within a thread view (Figure 1.C).

Highlighting related activities helps the user to instantly become aware of the distribution of an activity thread across the class e.g. selecting a blog post will highlight what groups provided most contributions. Simultaneously, the thread view shows the content of each related activity, helping assess the quality of the quantitative data. Visualizing discussion thread size can help students discover interesting threads. Teachers might understand low thread size as an indication for need of intervention. The attribute thread size is indicated by a number in each circle (Figure 1.B).

LARAe is a web application developed using HTML5, JavaScript and D3.js[1] running on a Node.js[2] web service and MongoDB[3] database. It supports both the proprietary API and Tin Can API[4]. It can easily be extended to support other APIs. The dashboard is designed to run on large displays, desktop computers and tablets. It is available at `http://ariadne.cs.kuleuven.be/LARAe/`.

The dashboard has also been deployed in an inquiry-based learning setting, visualizing the learner traces gathered from the weSPOT Inquiry system[5] [10].

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[2] `http://nodejs.org/`
[3] `http://www.mongodb.org`
[4] `http://tincanapi.com/`
[5] `http://portal.ou.nl/documents/7822028/f475d712-5467-40ea-968c-5aa00d951400`